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INDIVIDUALIZING INSTRUCTION IN LANGUAGE ARTS THROUGH DEVELOPMENT AND RESEARCH IN R AND I UNITS OF LOCAL SCHOOLS, 1965-1966.

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OF THE EIGHT INITIAL EXPERIMENTS CONDUCTED BY RESEARCH AND INSTRUCTION (R AND I) UNITS, ESTABLISHED IN WISCONSIN SCHOOLS TO DEVELOP AND EXECUTE EXEMPLARY INSTRUCTIONAL PROGRAMS AND CONTINUOUSLY IMPROVE THEM THROUGH A PROGRAM OF RESEARCH, THREE EXPERIMENTS ACHIEVED SIGNIFICANT RESULTS. IN ONE, 99 SIXTH-GRADERS RECEIVED THREE TYPES OF SPELLING INSTRUCTION--WORKBOOKS, AN INTEGRATED APPROACH IN WHICH STUDENTS WERE TAUGHT A SPELLING METHOD AND WERE LED TO APPLY THIS IN WRITING NEW WORDS, AND INDIVIDUALIZED INSTRUCTION. ON RECALL AND RECOGNITION TESTS AND A PROOFREADING TASK, PREVIOUS ACHIEVEMENT LEVELS WERE MAINTAINED REGARDLESS OF THE METHOD OF INSTRUCTION USED, AND FEMALES SCORED HIGHER THAN MALES. SPELLING ERRORS ON THEME WRITING REVEALED THAT WORKBOOK INSTRUCTION SHOWED THE LEAST TRANSFER TO A WRITING SITUATION. HOWEVER, FREQUENCY OF DICTIONARY USAGE WAS MARKEDLY HIGHEST UNDER THE SPELLING WORKBOOK APPROACH. TWO OTHER EXPERIMENTS, INVOLVING NINE-WEEK STUDIES IN HANDWRITING INSTRUCTION, WERE CONDUCTED BY THIRD- AND FOURTH-GRADE R AND I UNITS. LEGIBILITY RATINGS OF HANDWRITING SAMPLES UNDER NORMAL, FAST, AND BEST CONDITIONS INDICATED THAT ON THE THIRD-GRADE LEVEL THE TRADITIONAL GROUP-METHOD OF INSTRUCTION WAS MUCH LESS EFFECTIVE THAN THE DIAGNOSTIC INDIVIDUALIZED APPROACH. IN THE FOURTH-GRADE LEVEL EXPERIMENT, NO SIGNIFICANT DIFFERENCES IN IMPROVEMENT WERE FOUND BETWEEN THESE METHODS OF INSTRUCTION, BUT IMPROVEMENT IN LEGIBILITY WAS GREATER IN GRADE 4, WITH EITHER TREATMENT, THAN IN GRADE 3. OTHER UNITS CONDUCTED FIVE ADDITIONAL SHORT EXPERIMENTS IN READING, BUT NO SIGNIFICANT RESULTS WERE OBTAINED. (DL)

TECHNICAL REPORT NO. 19

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CENTER FOR
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RESEARCH
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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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Wisconsin Research and Development Center
for Cognitive Learning
The University of Wisconsin
Madison, Wisconsin

February 1967

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PREFACE

The R & D Center for Learning and Re-education has a four-step plan of operations in achieving its primary goal of improving efficiency of cognitive learning for children and youth: (1) extending knowledge about variables associated with school learning through research, (2) focusing knowledge on three main problem areas, (3) developing products based on research to achieve solutions to the problems, and (4) installing and field testing the products prior to making them available for consideration for national adoption. Relevant to executing these operations is the invention and refinement of mechanisms for improving learning through continuous development and experimentation in local schools. In other words, a facilitative environment must be created and maintained in a small number of schools so that controlled experimentation and the development and testing of materials and procedures may be executed efficiently. As one means of attaining the latter, R & I (research and instruction) Units have been established. The makeup and functions of R & I Units are described in the first section of this report, preceding descriptions of the eight experiments conducted during the second semester, 1965-1966.

In addition to the authors, the following Center and University staff have participated in some consultations regarding the research reported herein or in other activities associated with R & I Units: Dr. Thomas Barrett, Dr. Henry Van Engen, Dr. Max Goodson, Dr. George O'Hearn, and Dr. Wayne Otto.

Herbert J. Klausmeier
Co-Director for Research

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ABSTRACT

R & I (research and instruction) Units, established in schools in five Wisconsin Cities, are described as organizations that facilitate research and development on cognitive learning in schools. A learning specialist, or Unit leader, assumes leadership and is accountable to the building principal for the learning efficiency of students and for the coordination of the Unit's instructional and research activities. Other staff members are two or more certified teachers and one or more noncertified instructional personnel; the number of students varies according to the number of staff members. Over a period of years, the R & I Unit will develop and execute an exemplary instructional program and continuously improve it through a program of research. During the first semester that R & I Units were in operation in three school systems—spring 1966—the eight experiments described in this report were conducted.

For 15 weeks 99 sixth graders in three groups stratified by achievement level used three types of spelling instruction based on commercial materials—a workbook, an integrated approach, and individualized instruction. Scores on five measures of spelling performance and an attitude inventory constituted data gathered. On recall and recognition tests and a proofreading task, previous achievement level and sex showed significant effects with initial high achievers maintaining their score lead and girls scoring higher than boys. Frequency of dictionary usage was markedly highest under the spelling workbook approach which required use of the dictionary as part of the program. Spelling errors in theme writing indicated least transfer to a writing situation with the workbook instruction. Results of the attitude inventory showed equally favorable attitudes across treatments.

Third- and fourth-grade Units in one school each conducted a nine-week study of handwriting instruction. Legibility ratings of handwriting samples under normal, fastest, and best conditions constituted the data of the study. The formal approach previously used was found least effective at the third-grade level; a diagnostic individualized approach was most effective for the third grade although the other individualized instruction was also superior to the formal approach. At the fourth grade, no one treatment was superior to the others; the improvement in legibility was greater under all three treatments in Grade 4 than in Grade 3.

Five additional short experiments were conducted in reading. Due to the brief period of treatment, definitive results were rarely obtained. However, four benefits of the experiments deserve mention: (1) staff involvement on a problem of immediate concern to them; (2) development of staff appreciation of research as a tool for improving educational programs; (3) development of staff expertise with several approaches to the teaching of reading; and (4) development of a foundation upon which to build more sophisticated research undertakings in later years. These four benefits were also obtained in the three experiments of longer duration in which statistically significant results were obtained.

1
THE R & I CONCEPT

A project designed specifically to develop and test an organization that facilitates research and development on cognitive learning in schools was begun during the second year of the Center, 1965-1966—Project MODELS: Maximizing Opportunities for Development and Experimentation in Learning in the Schools. The main operations involved in the project are as follows:

—first defining and then installing in selected schools a new organizational pattern (R & I Unit) that succeeds team teaching and self-contained classrooms;

—establishing a new teacher-leadership position, that of the learning specialist or Unit leader, to head up each R & I Unit, and training these persons in research and development;

—organizing entire elementary school buildings into the R & I pattern with the building principal and Unit leaders comprising the curriculum decision-making body of the school building;

—conducting controlled experiments and developmental research in the R & I Units to determine how well the Unit can simultaneously execute its instructional, research, development, and innovation functions...

—field testing the Units to ascertain how well the R & I Unit and subsequently the building committee execute their functions.

The learning specialist, or Unit leader, assumes leadership and is accountable to the building principal for the learning efficiency of students in the Unit and for the coordination of instructional and research activities of the Unit. The other staff members of the R & I Unit are two or more certified teachers and one or more noncertified instructional personnel, full or part time. The number of students in a Unit varies according to the number of staff members and must be carefully proportioned so that efficient instruction can be carried on in the classroom while the learning specialist and at least one other staff member are in conference. For example, if a Unit includes the learning specialist and three certified teachers, each may work simultaneously with a group of students, or two teachers may provide instruction for all students while the learning specialist meets with the third teacher. The instructional schedule allows the learning specialist to work directly with the students for half of his time and to be available for consultation or planning sessions for the remainder.

The primary function of an R & I Unit is to provide excellent instruction for the students. In fact, the R & I Unit, over a period of years, will develop and execute a model or exemplary instructional program and continuously improve it through a program of research. The research in R & I Units is thus focused toward improvement of instruction, and two kinds of research are needed. The first type is devoted to the very practical problem of developing and maintaining the exemplary instructional program. The second kind of research is less immediate but is designed to generate new knowledge that can be continuously fed into improvement of classroom learning. Thus, as a research and development resource in the local school building, the R & I Unit is to develop and maintain an excellent instructional program for the local school system and is also a laboratory for research on human learning of the systematic kind that can be generated by R & D Center personnel. A more specific treatment of the instructional emphasis in R & I Units and of the general procedures for conducting research in these R & I Units will clarify these points.

THE INSTRUCTIONAL EMPHASIS IN R & I UNITS

Promoting efficient pupil learning through developing and executing an exemplary instructional program is the primary function of the R

& I Unit. Each Unit attempts to provide excellent instruction for each student. The best elements of team teaching—cooperative planning of the instructional program, utilizing the strength of all the staff, flexible scheduling, efficient use of materials, and the like—are characteristic of the instructional program in an R & I Unit.

An exemplary instructional program is not installed in a school overnight and maintained indefinitely. Rather, it is continuously evolving through a program of development and research.

In connection with developing the exemplary instructional program, it is assumed that the members of the Unit, members of the central staff of the local school system, building principals, and R & D staff will propose ideas. Likewise, members of the Unit will develop new instructional procedures, refine effective motivational techniques, identify and state appropriate instructional objectives, construct better tests, and the like. These are all development activities, essential to the maintenance of an exemplary instructional program.

Before any research is started on a systematic basis the R & I Unit must become properly organized within the school building, have appropriate facilities, adequate instructional materials, and achieve other conditions essential to effective instruction. When the central staff and the building principal have assured these conditions and when the Unit functions properly as a unit, it is appropriate to initiate research regarding any element of the instructional program and the total program.

GENERAL PROCEDURES FOR DEVELOPMENT AND RESEARCH ACTIVITIES IN R & I UNITS

The staff of the R & I Unit and other members of the local system generate ideas for research projects of a practical nature, directly related to the instructional program of the Unit and local school system. The Center staff also generates ideas for research. Regardless of where a research idea originates, three points are paramount:

First, the research deals with instructional matters or variables.

Second, the planning of any research project in any Unit of any school system always involves four persons—a member of the central staff of the local school, the building principal, the learning specialist, and a member of the R & D Center.

Third, the Center provides assistance in delineating a project and defining the instructional treatments, outlining a research design, planning measurement devices, performing statistical analyses of the data, and writing reports.

As the learning specialist develops greater capabilities he will assume greater initiative in these various activities. Further, local school systems have personnel of varying levels of capabilities with respect to these functions also. Thus, depending upon the size and capabilities of the staff of a local school, they exercise more initiative with respect to developing better instructional programs and then planning and executing related research. Research is interpreted broadly, not merely controlled experimentation narrowly defined.

The reports of activities which follow deal with only a small segment of the total program of any Unit. Most of the ideas for developing better instructional programs and conducting the related research originated with members of the local school system. The delimiting of the problem and the outlining of the independent variables or instructional treatments were largely the responsibility of the R & D Center staff and the learning specialists. In all the experiments there was mutual agreement that one "treatment" should be individualized instruction. This, in turn, required much planning by the Unit staff, and this treatment, of course, was executed for the first time during the experiment. The designing of the experiment, the identification of measurement devices, the statistical analyses of data, and the reporting of results in written form were at the initiative of the R & D Center staff. The development and execution of the instructional treatments was by the members of the respective Units that will be described subsequently, under the leadership of the learning specialist, who will also be indicated. The development and research to be described was conducted during the second semester of the 1965-66 school year. This was the first semester that R & I Units started operating in three school systems in Wisconsin—Racine, Janesville, and Madison.

II

THE COMPARATIVE EFFECTS OF THREE INSTRUCTIONAL APPROACHES ON SPELLING ATTAINMENT BY SIXTH-GRADE CHILDREN

Adams School, Janesville, Wisconsin

In Adams School of Janesville, Wisconsin, the Unit focused their early effort on developing an exemplary program in spelling. They conducted a 15-week experiment on the effectiveness of three instructional approaches to spelling. The teaching personnel in the Unit were Dwane Kamla (learning specialist), Joyce Bengston, Irene Salzman, and Marsha Briggs. Robert Cook is principal of the school.

PROBLEM

Developing the ability to spell correctly and quickly continues to be a primary instructional goal. How to achieve this goal effectively continues to be an instructional problem of high significance in elementary education. A large variety of commercial materials are continuously produced; some of these continue in the tradition of the first half of this century with graded lists and suggestions for mastery of them. Other materials are being prepared commercially which do not involve graded lists. Rather, some skills of spelling are taught which are subsequently to be applied in the whole language arts program. Materials are also being prepared commercially which are intended to encourage an individualized approach in spelling.

Commercially-prepared programs of spelling do not operate effectively without instruction by a teacher. This generalization was obvious to the teachers of the R & I Units at Janesville and also was apparent through a review of literature in spelling. (Space does not permit the presentation of the review of the literature for this or any of the other experiments in this report.) The specific problem which eventually emerged for development and research was a relatively simple one on the surface: to devise better approaches to spelling and determine which of three approaches to spelling instruction yielded most effective learning. While outwardly this appeared to be relatively simple and straightforward, its execution and instrumentation were complex.

METHOD

Subjects

The subjects were 99 pupils regularly enrolled in the sixth grade of Adams Elementary School, Janesville, Wisconsin. The students were somewhat above grade level according to the national norms on the Stanford Achievement Test.

Experimental Treatments

The instructional treatments were closely related to instructional materials. In fact, the materials and the related teacher activities comprised the three treatments. They are detailed below:

(1) Spelling Workbook: This technique utilized the method already in use and was partially based on a workbook titled Spelling for Word Mastery, Book VI (Charles Merrill, publishers). The basic sequence of steps in this method is indicated below:

a. Study: Introduction to new words (by the teacher) and using the new words.
b. Test: Trial test.
c. Study: Study words missed.
d. Test: Final test.

The testing procedure, which occurs weekly or after each study list, consists of the following steps:

a. Teacher pronounces word.
b. Teacher uses word in a sentence.
c. Teacher pronounces word.
d. Students write word.

(2) Harper and Row Basic Speller (Integrated spelling): This relatively recent approach uses both induction and deduction in the teaching of spelling. Children are taught a spelling method and are led to apply this in writing new words. Memorization of words is kept at a minimum, and the language arts are integrated into this approach. Weekly spelling tests are not used; rather tests occur after sections of the book are completed. Less systematic testing and also less work on specific words are done in this approach, compared with the previous one.

The testing procedure involves the same steps as Treatment 1. A supplementary spelling list used for enrichment is given with each new unit to apply the rules stressed in the unit lesson.

(3) SRA Spelling Word Power Laboratory (Individualized spelling): This individualized approach allegedly allows each pupil to proceed at his own rate. By means of a placement guide, each student begins in the lab at a point where he should meet a reasonable degree of success. The materials are self-operating and self-correcting; the essential device used is termed the learning wheel, where spelling ideas and rules are introduced to the student followed by pupil practice in applying them. Each child records his own progress in his student record book.

The testing procedure in this program consists of check tests after several learning wheels have been used. A second check test is available for re-testing those pupils whose initial performance indicates that further study is needed. In addition, spelling achievement survey tests are available for periodic testing of all the students.

Procedures and Design

The pupils were first listed according to sex and then each sex stratified into three levels according to scores on a pretest in spelling. Within this design, students were randomly assigned to treatments. From the total of 99 students, three groups were formed randomly. The experiment lasted 15 weeks. In executing the experiment the teachers rotated weekly among the three groups of pupils in order that the instructional treatments, rather than the three teachers' characteristics or methods, would be tested.

Data Gathered

In experiments of this type, it is desirable to secure (a) measures of student performance directly related to the instructional treatments, (b) pupil opinions regarding the treatments, and (c) judgment of the teachers about the treatments. Further, the measures of performance should be developed to assess outcomes that are common to all three treatments and also outcomes that are unique to each treatment. Time did not permit the development of these more precise and content-valid measures of student performance. Instead, five measures related to spelling performance were obtained; a pupil attitude inventory was constructed and administered; and four subtests of the Stanford Achievement Tests—Usage, Punctuation, Capitalization, and Dictionary Skill—were administered to secure base line data regarding the total instructional program. (The latter four are not reported further.) The judgments of the Unit personnel were gathered informally and are given in the last part of this chapter in the "Discussion" section.

The first six measures are now described in more detail.

(1) Spelling Ability Tested Via Recall Mode: This instrument consisted of 60 works, drawn primarily from the Morrison-McCall Spelling Scale. The instrument was tape-recorded and played via an intercom system. This instrument was pilot-tested and subsequently modified to increase its power to discriminate among pupils: no attempt was made to relate the test content to the three programs. Each paper was scored for the number of words correct.

(2) Spelling Ability Tested Via Recognition Mode: The Spelling subtest of the Stanford Achievement Test Intermediate II, Form W, was used. Score was number right. No attempt was made to relate the content of the test to the treatments.

(3) Frequency of Dictionary Usage: Each student recorded a tally every time he referred to the dictionary. Although students varied in their meticulousness on this task, it was assumed that such variance existed in about the same degree in all three treatment groups. The frequency of dictionary usage was further subdivided into use during the treatment phase and during the posttest phase. Frequencies obtained demonstrated virtually no use during the posttest phase, so only the frequencies of usage during the treatment phase were analyzed.

This measure was uniquely related to one of the treatments, namely, the spelling workbook, in that referring to the dictionary is directly written into the program.

(4) Transfer of Spelling Skill to a Standard Writing Task: Before the scheduled posttest session, students wrote a one-page paper summarizing a unique school event, an Around-the-World Dinner, unaware that particular attention would be paid to the spelling in the paper. The score obtained for each pupil was the number of words misspelled for each 100 words written. This measure was not uniquely related to any treatment.

(5) Spelling Ability Tested Via Proofreading: A passage from a sixth-grade reading textbook was systematically altered to contain 30 spelling errors. This locally-produced test was tried out and subsequently modified. Papers were scored for two quantities: errors corrected and additional errors created. Since the latter produced primarily zero scores, only the former was analyzed. This measure was not uniquely related to any treatment.

(6) Attitudes Toward Spelling: This locally-produced instrument consisted of 12 items, 6 school-related and 6 not related to school. Students responded on a three-point scale: unfavorable, neutral, and favorable, scored 0, 1, and 2, respectively. Each treatment group, of course, responded only to the unique treatment it received.

Scoring and Analysis of Data

All instruments were scored by a team of scorers at the R & D Center; none of the scorers knew which students were in which treatments. Analysis of variance was used on all cognitive and non-cognitive measures. Except on the attitude test, sex and previous spelling achievement were utilized in the analysis as stratifying (assigned independent) variables while treatment served as an active independent variable.

RESULTS

In this section and throughout the report, mean squares and F ratios will be presented for each statistical analysis. For each main effect or interaction statistically significant at or beyond the .05 level, the relevant means will be reported in the various tables that follow.

Table A1

F Ratios and Mean Squares for Recall Spelling Scores

Source	df	MS	F
Treatment (T)	2	24.54	-
Previous Achievement (P)	2	4841.23	95.87***
Sex (S)	1	919.48	18.21***
T × P	4	41.75	-
T × S	2	14.90	-
P × S	2	25.46	-
T × P × S	4	25.09	-
Error	81	50.50	

*** $p < .001$

Note—In this and all subsequent F ratio tables, a dash indicates a value of $F < 1$.

The resultant F ratios of the analysis of variance on the recall scores are presented in Table A1. Treatment was not significant. Both previous achievement level and sex were highly significant. Those who scored high at the start of the experiment also were high at the end. Also, girls scored higher than boys. The pertinent means, designated $\bar{X}$, and standard deviations, designated s, by previous achievement levels and sex are recorded in Table A2. Regardless of treatment, the top one-third of the students had over twice as many words correct (45.15) as did the low one-third (20.72). Since these words were selected on the basis of their discrimination power, the scores do not necessarily reflect how well the pupils learned.

Table A2

Mean Number Correct and Standard Deviations for Significant Main Effects, Recall Spelling Scores

Main Effect	Achievement Level	$\bar{X}$	s
Previous Spelling Achievement	High	45.15	7.17
	Average	32.48	6.39
	Low	20.72	8.84
Sex	Male	30.20	11.82
	Female	35.29	12.65

Table A3 contains the summary of the analysis of recognition spelling scores on the Stanford Achievement Test. Again, previous

Table A3

F Ratios and Mean Squares for Recognition Spelling Scores

Source	df	MS	F
Treatment (T)	2	3.36	-
Previous Achievement (P)	2	4345.76	117.83***
Sex (S)	1	658.41	17.85***
T × P	4	15.01	-
T × S	2	39.66	1.08
P × S	2	18.87	-
T × P × S	4	16.90	-
Error	81	36.88	

*** $p < .001$

Table A4

Mean Number Correct and Standard Deviations for Significant Main Effects, Recognition Spelling Scores

Main Effect	Level	Equivalent Grade Placement	$\bar{X}$	s
Previous Spelling Achievement	High	8.8	47.56	6.52
	Average	6.8	35.91	6.52
	Low	5.1	24.09	6.09
Sex	Male	6.6	33.73	10.92
	Female	7.0	37.98	11.92

achievement level and sex were significant. The interactions were not significant. The means for the three achievement strata and two sexes and the equivalent grade placements are reported in Table A4. Again the means relevant to previous spelling achievement are in the expected direction and again girls' performances exceeded boys'. The equivalent grade placements are quite high for sixth-graders. On the Stanford test also, the difference between the top one-third and bottom one-third of all the pupils were quite large, the mean score being 47.56 and 24.09 for the top and bottom one-thirds, respectively.

Frequency of dictionary usage was analyzed; the results are presented in Table A5. Treatment was significant at the .001 level; no other main effect or interaction reached significance.

Table A5

F Ratios and Mean Squares for Frequency of Dictionary Usage

Source	df	MS	F
Treatment (T)	2	642.57	20.05***
Previous Achievement (P)	2	15.57	-
Sex (S)	1	16.82	-
T × P	4	34.43	1.07
T × S	2	27.02	-
P × S	2	24.38	-
T × P × S	4	34.12	1.06
Error	81	32.05	

*** $p < .001$

Table A6

Mean Frequency and Standard Deviations for Significant Main Effect, Dictionary Usage

Main Effect	Level	$\bar{X}$	s
Treatment	Spelling Workbook	11.29	7.67
	Integrated	5.13	4.71
	Individualized	2.94	3.47

The means for the three treatments are presented in Table A6. The frequency of usage was markedly highest under the traditional spelling workbook approach. As noted before, the pupils are required to use the dictionary as part of the program.

Spelling errors made when writing a theme were counted and subsequently treated by analysis of variance. The resulting F ratios are shown in Table A7. All three main effects were significant but no interactions were. The relevant mean errors and standard deviations are noted in Table A8. The error rate was higher for males (4.74) than for females (2.35). Also, the pupils of lowest initial spelling ability made about four times as many errors (6.18) as did those of highest ability (1.58). The mean error rate was highest for the currently used

Table A7

F Ratios and Mean Squares for Errors in Written Themes

Source	df	MS	F
Treatment (T)	2	40.64	3.41*
Previous Achievement (P)	2	202.92	17.02***
Sex (S)	1	162.53	13.63***
T × P	4	4.38	-
T × S	2	25.34	2.12
P × S	2	29.68	2.49
T × P × S	4	11.69	-
Error	81	11.92	

*p < .05
***p < .001

Table A8

Mean Number of Spelling Errors Per 100 Words and Standard Deviations for Significant Main Effects, Written Theme

Main Effect	Level	$\bar{X}$	s
Treatment	Spelling Workbook	4.59	5.75
	Integrated	2.44	3.04
	Individualized	3.05	2.93
Previous Spelling Achievement	High	1.58	1.68
	Average	2.61	2.29
	Low	6.18	5.99
Sex	Male	4.74	5.43
	Female	2.35	2.54

workbook approach (4.59), lowest for the integrated approach (2.44), and intermediate for the individualized approach (3.05). It may be recalled from the preceding discussions of the three methods that the integrated approach does not emphasize the learning of specific word lists but does emphasize rules and methods with application to the writing of words. The results of this test, then, indicate that the workbook method resulted in lowest transfer to a writing situation; the other two methods were better and not significantly different from one another.

Table A9

F Ratios and Mean Squares for Spelling Ability in Proofreading Task

Source	df	MS	F
Treatment (T)	2	9.62	-
Previous Achievement (P)	2	1121.54	62.47***
Sex (S)	1	191.77	10.68**
T × P	4	8.81	-
T × S	2	12.16	-
P × S	2	32.63	1.82
T × P × S	4	7.47	-
Error	81	17.95	

**p < .01
***p < .001

Table A10

Mean Errors Corrected and Standard Deviations for Significant Main Effects, Proofreading Task

Main Effect	Level	$\bar{X}$	s
Previous Spelling Achievement	High	20.50	4.71
	Average	14.45	4.72
	Low	8.56	3.45
Sex	Male	13.36	5.99
	Female	15.64	6.80

The results of the analysis of variance for a proofreading task are given in Table A9. Here incorrect spellings in a passage were to be identified and corrected. The only significant sources were the main effects of previous spelling achievement level and sex; the means and standard deviations for these effects can be found in Table A10. Females outperformed males identifying and correcting 15.64 and 13.36 errors respectively. The high previous achievers did better than the average, who in turn did better than the low; the mean number of spelling errors identified being 20.50, 14.45, and 8.56, respectively.

Table A11

F Ratios and Mean Squares for Attitudes Toward Spelling by School Relatedness

Source	df	School-Related		Not School-Related		Total	
		MS	F	MS	F	MS	F
Treatment	2	9.35	1.98	4.32	1.25	15.30	1.47
Error	96	4.72		3.45		10.74	

The analysis of the attitude scores is presented in Table A11. As the instrument was given anonymously, information on sex and previous achievement level was not available. It is readily apparent in the table that the treatment effect was non-significant. Thus, each group had equally favorable attitudes about the program it received.

DISCUSSION

The R & I Unit developed two new approaches to spelling instruction in a relatively short period of time. These new approaches and the one already in use during the prior semester were executed during a 15-week period. An excellent experiment was conducted which eliminated the confounding of both teacher characteristics and pupil characteristics with the instructional approaches. This confounding has been a principal deterrent to interpretable experimentation on classroom learning thus far in the history of American education.

The three experimental treatments did not produce marked differences in spelling ability over the 15-week period as measured by three spelling tests not directly related to any one of the treatments. In two cases, however, treatment did reach significance. Dictionary usage under the spelling workbook treatment was considerably more frequent (11 times) than under the integrated (5 times) or individualized (3 times) approaches. This in part is due to the publishers' suggested uses of their material; dictionary usage is directed more often under the spelling workbook approach. Thus, one unique feature of this approach resulted in significantly better performance than the other two approaches.

The second significant treatment effect was the number of spelling errors committed in a theme-writing task. The non-reactivity and unobtrusiveness of this measure adds to its importance. Pupils in the workbook treatment committed approximately twice as many errors as pupils under the other two treatments. Thus, despite the greater frequency of dictionary usage by the workbook group and equally high performance on the general spelling tests, less transfer to an actual writing situation apparently occurred.

Despite no significant difference on the Stanford Achievement Test in spelling among the three treatment groups, the average gain for the entire group of 99 pupils was seven months during the four months that the experiment was in progress. It is possible that since spelling received special attention, the total achievement level for all groups increased, thus reducing the possibility for attaining significant differences among the groups.

No treatment effect was in evidence for attitudes toward spelling. Although no interaction was significant, sex and the level of previous spelling achievement were repeatedly significant main effects. In every case of significance, girls outperformed boys; and the high group at the outset, independent of instructional treatment, remained high at the end of the experiment.

The members of the R & I Unit and the building principal felt that the experience of each teacher working with three approaches to teaching spelling was valuable. The study was heuristic in that it led to much discussion and hypothesis-formation among the group. The staff acquired considerable knowledge about spelling instruction and educational research; also their capabilities for defining instructional treatments and executing research were extended markedly.

The R & I Unit extended the development of an exemplary instructional program to the entire instructional program in the first semester, 1966-67. Also, a second controlled experiment is underway to measure the effectiveness of three approaches to spelling instruction with certain refinements and modifications being made to each of the three original treatments.

The workbook approach will provide more enrichment activities for the better spellers.

They will be encouraged to complete as many spelling units as they can in the Spelling for Word Mastery, VI, Charles Merrill, and also to engage in additional activities. The slower spellers in this treatment will use the Lyons and Carnahan workbook, My Word Book, 5. Their progress will be commensurate with their demonstrated spelling ability.

The second treatment will utilize the spelling workbook Spelling for Word Mastery, VI, Charles Merrill, but in addition will use individualized materials from in the SRA Spelling Word Power Laboratory.

The final treatment is a completely individualized program, utilizing teacher-produced materials. A master list of 750 spelling words has been chosen from four sources: (1) common words, consisting of words which are found in the spelling workbook and the SRA materials; (2) unique words, defined as words which are not common to the spelling workbook and the SRA materials; (3) common spelling "demons" taken from four well-known lists; and (4) words from the basal reading texts used by the children in the Unit. Twenty-five spelling words will be randomly chosen from this master list for each unit of study. The words will be used in a variety of activities to facilitate the learning of skills according to the individual needs of the students. The activities will be limited to the categories of:

(1) Working with words (identifying base words, finding new words, building words, using synonyms, antonyms, and homonyms, etc.);
(2) Using the dictionary (syllabication, accent marks, alphabetizing, etc.);
(3) Learning some of the commonly-accepted spelling rules;
(4) Constructing sentences and paragraphs;
(5) Writing themes and proofreading; and
(6) Undertaking original projects.

The primary objective of the individualized treatment is to make children more aware of their spelling and to integrate spelling into the entire curriculum. It is hypothesized that it will produce best initial learning and transfer. However, it is also the most difficult treatment to execute.

III

THE COMPARATIVE EFFECTS OF THREE METHODS OF HANDWRITING INSTRUCTION ON PUPIL SKILL IN HANDWRITING

Giese Elementary School, Racine, Wisconsin

The teaching personnel in the R & I Units at Giese School in Racine included a learning specialist, Marilyn Kletecka, and three certified teachers, Anne Buchanan, Charles Leonard, and Mary Rounds, at the fourth level; and, at the third level, learning specialist Maxine Vohs and teachers Janet Hansen, Beverly Schinderly, and Sammye Woods. The building principal, Earl Nelson, assisted substantially in the development of two new approaches to handwriting and also of new approaches to reading reported in the next section. Special mention is also due Richard Larson, Wayne Otto, Carl Reck, and Elizabeth Williams for their perceptive comments on the handwriting project during the planning phase.

PROBLEM

The purpose of these Units was to develop an exemplary program in handwriting for third- and fourth-grade children and to conduct an experiment related thereto in order to determine which of three approaches yielded best results. This purpose arose from a need to evaluate the program presently used and to develop other programs for possible adoption if they demonstrated superiority to the one presently employed. Teaching personnel were uniformly dissatisfied with the handwriting skills of many of their pupils.

The specific question examined in this experiment was the relative effectiveness of three handwriting treatments upon selected measures of pupils' handwriting performance. The treatments of concern were: (1) a formal group method, (2) an individualized-instructional method, and (3) a formal individualized method.

METHOD

Subjects

The subjects were 88 third-grade and 75 fourth-grade pupils from Giese School, Racine, Wisconsin. Pupils were randomly assigned to one of three treatments following stratification by sex and by three levels of achievement. The latter levels were determined by weighting equally previously-obtained scores of general mental ability and standardized educational achievement.

Experimental Treatments

The three treatments utilized materials of quite dissimilar characteristics, as can be noted in the descriptions below:

(1) Formal Group Method: This treatment might best be described as the "traditional" approach to teaching handwriting. The third grade used Adventure in Handwriting—Peterson Directed Handwriting, published by the Macmillan Company, The Correlated Handwriting Series, by F. N. Freeman, Zaner-Bloser publisher, was used by the fourth level pupils.

(2) Individualized Instructional Method: This treatment was basically a diagnostic-corrective program; and, as such, no commercially prepared program was used. The techniques in large part were determined on the basis of teacher judgment about the needs of the individual subjects. For example, the teacher would circle writing errors and these determined diagnostic treatment in subsequent lessons.

(3) Formal Individualized Method: This treatment was implemented by using The Penskill Individualized Handwriting Skills Program, by R. G. Larson, published by

Science Research Associates, Inc. Much responsibility rested with the individual pupil under this approach.

Data Gathered

Data consisted of handwriting samples from each child, given both as pre- and post-measures. The pupils were given three different instructional sets, and the legibility quality of the handwriting produced under these three conditions was analyzed separately. The three conditions are detailed below:

(1) Normal Condition: Teachers had their pupils continuously write a standard sentence (Big oxen, quick zebras, fighting monkeys, and wild pigs have jungle homes.) after instructing them to write as they usually wrote. A five-minute work sample was secured. A total word count was obtained for each subject, and the third sentence (or the last completed sentence for slower pupils) was rated for legibility quality by three independent judges.

(2) Best Condition: Pupils were instructed to write the same sentence four times as well as they could. The third sentence was judged for legibility as above.

(3) Fastest condition: Teachers instructed their pupils to continuously write the same sentence as fast as they could. Word counts of a five-minute work sample were obtained for each pupil, and the third sentence produced was judged for legibility.

Procedures and Design

Treatments were administered to the respective groups for 15 minutes each day during the nine weeks of the study. Teachers were systematically rotated across treatments to control this source of variance. Each teacher taught each method one-third of the nine weeks. This was equally true for the three teachers of Grade 3 and the three of Grade 4. Procedures specified by the publishers were used as applicable, except in the individual instructional method where teacher's diagnosis was the criterion.

In addition to the treatment variable, two assigned independent variables were utilized, sex and previous achievement-ability level. Three-way analyses of covariance were performed on each of the five measures available: number of words produced under normal and fastest instructions, and judges' ratings of handwriting legibility under normal, best, and fastest conditions. The covariate used in each analysis was the corresponding score in the pretest situation. Separate analyses were performed for Grades 3 and 4.

Scoring and Analysis of the Data

The 978 sentences to be judged (163 subjects × 3 conditions × 2 testing sessions, pre- and post-) were coded and mixed thoroughly before being scored. No judge knew the conditions under which a particular sentence was written, whether it was a third or fourth grader's effort, or whether it was a pre- or post-measure.

Initially a rating of one to five (low to high legibility) was given to each sentence by each judge. Judges worked independently and compared the handwriting sample to a key containing 20 "versions" of the sentences; the 20 sentences were each in one of five quality levels.

The difficulty experienced by the judges in assigning the "higher" ratings of 3, 4, and 5 stimulated a rebuilding of the scoring scale. This was done empirically, utilizing 33 participants in the 1966 Learning Specialist Summer Institute. The 20 sentences were presented individually to the 33 educators who ordered them on the basis of legibility. A stanine scale of handwriting legibility was developed and the 978 sentences scored a second time. Separate analyses were performed on the basis of the initial and subsequent scorings.

In all cases, the three ratings of a single sentence were averaged to determine the final score recorded. Inter-judge reliability of some magnitude was established by means of training sessions before any experimental data were judged.

RESULTS

In Table B1 are presented the average inter-judge reliability coefficients for the three raters of the pre- and post-experiment handwriting samples. The average of the coefficients was slightly higher on the rescore 9-point scale.

Table B2 presents the *F* ratios generated by the analysis of covariance for Grade 3 under the initial scoring procedure. Treatment was significant for the normal and fastest ratings. Previous achievement-ability level was significant only for the number of words written in five minutes under normal instructions, while sex was significant on every measure except number of words written under fast instructions. In no case did any effect related to the number of words written under fast instructions reach

Table B1

Inter-Judge Reliability

Occasion	Correlation between Judges 1 & 2	1 & 3	2 & 3	Average Reliability
Initial Scoring (5-point scale)	.72	.81	.78	.77
Rescore (9-point scale)	.83	.77	.81	.80

Table B2

F Ratios and Mean Squares for Speed and Legibility of Handwriting, Initial Scoring, Grade 3

Source	df		Dependent Variable: No. of Words Normal	No. of Words Fast	Normal Rating	Best Rating	Fastest Rating
Treatment (T)	2	MS	96.13	96.41	1.54	.39	.96
		F	2.54	1.40	5.31**	1.25	4.38*
Previous Achievement-Ability Level (P)	2	MS	147.88	107.40	.01	.22	.36
		F	3.91*	1.56	-	-	1.64
Sex (S)	1	MS	160.37	1.13	1.67	2.41	1.99
		F	4.24*	-	5.76*	7.74**	9.11**
T × P	4	MS	77.50	7.69	.13	.26	.24
		F	2.05	-	-	-	1.11
T × S	2	MS	4.06	94.68	.62	.45	1.12
		F	-	1.38	2.14	1.43	5.09**
P × S	2	MS	113.30	22.70	.30	.33	.08
		F	3.00	-	1.02	1.05	-
T × P × S	4	MS	56.10	23.66	.44	.14	.06
		F	1.48	-	1.51	-	-
Covariate	1	MS	2638.90	4529.02	6.92	8.73	4.43
		F	69.85***	65.90***	23.84***	27.98**	20.24***
Error	69	MS	37.78	68.73	.29	.31	.22

*p < .05

**p < .01

***p < .001

Note—In this and all subsequent F ratio tables, a dash indicates an F < 1.

significance. The covariate was highly significant in each instance.

Relevant adjusted means for the significant main effects are presented in Table B3. From the table, the superiority of the individualized-instructional method over the formal group method is clear. The difference between the individualized-instructional and the formal individualized did not reach statistical significance. The high ability-achievement group made significantly greater gains than the average and low groups on the speed of writing

Table B3

Adjusted Means (Number of Words Written and Legibility Ratings) for Significant Main Effects, Speed and Legibility of Handwriting, Initial Scoring, Grade 3

Main Effect	Level	Dependent Variable: No. of Words Normal	Normal Rating	Best Rating	Fastest Rating
Treatment	Formal Group	NS	1.47	NS	1.35
	Ind.-Instr.		1.94		1.71
	Formal Ind.		1.69		1.47
Previous Ach.-Abil. Level	High	28.98	NS	NS	NS
	Average	25.11			
	Low	24.47			
Sex	Male	24.80	1.54	1.65	1.34
	Female	27.58	1.86	2.05	1.68

Note.—NS = Not Significant.

under normal instructions. Third-grade girls not only wrote faster than boys under normal instructions, they also wrote more legibly under all three instructional conditions, normal, best, and fastest. The significant treatment by sex interaction for the fastest rating (Table B2) occurred because of the exceptional performance of the girls under the individualized-instructional treatment.

When the stanine scale was used to rejudge the third-grade handwriting samples, some changes did occur. The F ratios that resulted are given in Table B4. It can be noted that treatment was significant in each case. Previous achievement-ability level reached significance for the handwriting rating under fast instructions. Sex was no longer significant on all three ratings, but it was for the normal rating; the F ratios were sizeable but short of statistical significance on the best and fastest ratings. The covariates were again highly significant.

Table B5 contains the pertinent adjusted means for the significant main effects. In the cases of the normal and best ratings, the individualized-instructional and formal individualized were significantly higher than the formal group but not significantly different from each other. However, on the fastest rating, only the individualized-instructional treatment was significantly higher than the formal group method. The source of the significant F for previous achievement was the low and medium groups' superiority over the high group on the fastest rating. Girls' handwriting received a significantly higher rating than boys' under normal instructions.

Somewhat different results were apparent when the Grade 4 analyses were completed. Table B6 outlines the F ratios that occurred using the initial scoring scale. Generally speaking, fewer treatments of significance were found at level four as only the best rating reached significance. Previous achievement-ability level was significant for the normal and best ratings, while sex reached significance on all three ratings. It can be noted that no significant effects occurred relating to the number of words written. Covariates were highly significant as they had been for Grade 3.

The appropriate adjusted means are presented in Table B7. The formal individualized treatment was significantly higher than the individualized-instructional on the best rating, but not significantly different than the formal group performance. Under normal writing instructions, pupils in the average previous achievement-ability level made significantly greater gains in legibility than pupils in the low stratum. Under best writing instructions, fourth graders in both the high and average strata outgained pupils in the low level. Female fourth graders performed better than their male counterparts on all three ratings. The significant treatment by previous achievement-ability level interaction for the handwriting rating under fast instructions was primarily due to relatively high adjusted means for the low stratum under all three treatments and the marked low rating for the average stratum pupils under the formal group treatment.

Table B4

F Ratios and Mean Squares for Legibility of Handwriting, Rescore, Grade 3

Source	df		Dependent Variable: Normal Rating	Best Rating	Fastest Rating
Treatment (T)	2	MS	4.38	2.66	2.42
		F	5.36**	3.24*	3.51*
Previous Achievement-Ability (P)	2	MS	.64	.05	2.65
		F	-	-	3.86*
Sex (S)	1	MS	8.40	2.15	2.59
		F	10.29**	2.61	3.76
T × P	4	MS	1.22	1.18	.70
		F	1.49	1.44	1.02
T × S	2	MS	.45	.17	1.16
		F	-	-	1.68
P × S	2	MS	1.31	.06	.10
		F	1.59	-	-
T × P × S	4	MS	.78	.06	.09
		F	-	-	-
Covariate	1	MS	25.28	33.57	34.88
		F	30.96***	40.87***	50.77***
Error	69	MS	.82	.82	.69

*p < .05
**p < .01
***p < .001

Table B5

Adjusted Means (Legibility Ratings) for Significant Main Effects, Legibility of Handwriting, Rescore, Grade 3

Main Effect	Level	Dependent Variable: Normal Rating	Best Rating	Fastest Rating
Treatment	Formal Group	2.48	2.88	2.39
	Ind.-Instr.	3.14	3.44	2.98
	Formal Ind.	3.17	3.36	2.69
Previous Ach.-Abil. Level	High	NS	NS	2.32
	Average			2.95
	Low			2.79
Sex	Male	2.56	NS	NS
	Female	3.30		

Note.—NS = Not Significant.

Table B6

F Ratios and Mean Squares for Speed and Legibility of Handwriting, Initial Scoring, Grade 4

Source	df		Dependent Variable: No. of Words Normal	No. of Words Fast	Normal Rating	Best Rating	Fastest Rating
Treatment (T)	2	MS	217.08	8.58	.60	1.12	.16
		F	3.04	-	1.61	3.29	-
Previous Achievement-Ability Level (P)	2	MS	186.01	174.48	1.24	2.30	.39
		F	2.61	1.99	3.34*	6.73**	-
Sex (S)	1	MS	.15	19.40	4.48	4.77	3.86
		F	-	-	12.15***	13.99***	8.99**
T × P	4	MS	18.04	33.32	.19	.10	1.45
		F	-	-	-	-	3.38*
T × S	2	MS	12.25	16.20	.02	.04	.16
		F	-	-	-	-	-
P × S	2	MS	.90	17.20	.22	.26	.42
		F	-	-	-	-	-
T × P × S	4	MS	78.15	49.06	.56	.25	.24
		F	1.09	-	1.51	-	-
Covariate	1	MS	1422.81	2686.82	16.16	7.44	15.28
		F	19.93***	30.68***	43.87***	21.79***	35.57***
Error	56	MS	71.39	87.59	.37	.34	.43

*p < .05
**p < .01
***p < .001

Table B7

Adjusted Means (Legibility Ratings) for Significant Main Effects, Legibility of Handwriting, Initial Scoring, Grade 4

Main Effect	Level	Dependent Variable: Normal Rating	Best Rating	Fastest Rating
Treatment	Formal Group	NS	2.83	NS
	Ind.-Instr.		2.75	
	Formal Ind.		3.15	
Previous Ach.-Abil. Level	High	2.68	3.22	NS
	Average	2.91	3.08	
	Low	2.44	2.44	
Sex	Male	2.41	2.62	1.95
	Female	2.95	3.20	2.44

Note.—NS = Not Significant.

Table B8

F Ratios and Mean Squares for Legibility of Handwriting, Rescore, Grade 4

Source	df		Dependent Variable: Normal Rating	Best Rating	Fastest Rating
Treatment (T)	2	MS	.14	1.65	.22
		F	-	2.35	-
Previous Achievement-Ability Level (P)	2	MS	1.96	1.58	.91
		F	2.34	2.24	-
Sex (S)	1	MS	9.85	6.25	6.44
		F	11.76**	8.92**	5.78*
T × P	4	MS	.65	.64	1.97
		F	-	-	1.77
T × S	2	MS	1.01	.19	.37
		F	1.21	-	-
P × S	2	MS	.71	.28	1.85
		F	-	-	1.66
T × P × S	4	MS	1.54	.78	.45
		F	1.84	1.12	-
Covariate	1	MS	21.95	20.52	25.64
		F	26.21***	29.28***	23.00***
Error	56	MS	.84	.70	1.11

*p < .05
**p < .01
***p < .001

Analyses run on rescored fourth-grade data produced few significant effects as is indicated in Table B8. Sex was significant for all three ratings, but the significant treatment F under best instructions and the formerly significant F's for previous achievement-ability level under normal and best instructions failed to reach statistical significance. The F ratios were sizeable, however, and the adjusted means in the same relative order as on the initial scoring. Covariates were highly significant.

The pertinent adjusted means for sex are presented in Table B9. In each case, girls did better than boys.

Table B9

Adjusted Means (Legibility Ratings) for Significant Sex Effects, Legibility of Handwriting, Rescore, Grade 4

Level	Dependent Variable: Normal Rating	Best Rating	Fastest Rating
Male	4.30	4.69	3.53
Female	5.09	5.34	4.16

DISCUSSION

Both Units successfully developed two new instructional approaches and executed them in a well-designed experiment. Although the experiment was of necessity of short duration, an exemplary instructional program appears to be in the making. Evidence was gathered which indicates that the formal handwriting approach used up to the present at Giese School is not as effective as other approaches, particularly at the third-grade level. Both individualized approaches to teaching handwriting were consistently more effective in promoting legibility than was the formal method. At third grade, the better individualized approach was the diagnostic instructional, using no special com-

mercial program. The evidence seems substantial enough for an individualized procedure in beginning handwriting that a replication study with similar results logically should lead to a definite movement away from the traditional approach.

Results at the fourth-grade level were not as definitive. In only one case was treatment significant, under best instructions for the initial scoring. In this particular case, the treatment that was most effective in the third grade was least effective in Grade 4. It should be kept in mind that the third and fourth graders were quite dissimilar populations: a marked development probably occurs in handwriting skill in the intervening year between late third and late fourth grade; and, in addition, all fourth graders had received an additional year of "traditional" handwriting instruction before the experiment commenced. It may well be that the critical item in the early development of handwriting legibility is individualized attention, yet this same individualization may not be so effective after a pupil's level of handwriting legibility is moderately well-established. It is possible that some combination of the individualized-instructional and formal-individualized methods would produce most efficient performance in Grade 3. Even though no treatment appeared differentially more effective in Grade 4, the absolute gains in legibility from pre- to posttest were substantial under all three treatments, much more so than in the third grade.

Females were significantly and consistently higher than males on most of the measures. This fact might be dismissed casually by some because of the usual superiority of females on many school-related tasks. However, it must be remembered that in the analyses of covariance, initial handwriting skill was "covaried" out of the resulting post-performances. Thus, these consistent advantages for the girls were generated in just nine weeks. It might be noted in passing that the small bias favoring some female handwriting characteristic may exist in the initial 5-point scale; significance levels for sex were lower on all rescore analyses except one.

Differential gains in handwriting skill by pupils in the three previous achievement-ability levels were not entirely consistent. More often than not, however, children from the lowest achievement-ability level progressed the least.

Several tangential aspects of this experiment were particularly rewarding and stimulating. The process of empirically constructing a second legibility scale was instructive. The authors reported the results under both scoring scales because they were available and tended to add depth to the analysis; the 9-point constructed scale seems the better of the two for rating handwriting samples for legibility. Of some assistance in future work in this area would be the requirement that pupils use similar, even standardized, writing instruments during the test sessions. Line width variance might thus be reduced and make the judges' task easier.

A second tangential point of interest was that the validity of the measuring instrument, the reliability of the judges' scoring, the power of the instructions used, and the attention paid by the pupils to the "test" situations are all attested to by the tone of the data collected. For example, a greater number of words were written under faster than under normal instructions. More important, best samples of handwriting were rated more legible than normal handwriting samples; legibility under fastest instructions was consistently rated below samples obtained under normal and best instructions (see Tables B3, B5, B7, and B9). It is also noted that both handwriting speed and legibility rating increased substantially from the third- to fourth-grade students in the study.

Finally, teachers from the R & I Units provided several appropriate and relevant comments regarding the experiment, particularly for future work in the same area. They uniformly felt that the experiment was a stimulating and worthwhile activity but that the daily amount of time provided for handwriting (15 minutes) was too short; longer daily sessions were suggested.

Teachers seemed to have developed more confidence in the individualized method (SRA Penskills) than in the others, especially if only certain types of more able pupils were given the treatment. (Note, however, that the treatment by previous achievement-ability level interaction was significant in only one instance.) A few teachers felt that they should not have been rotated between treatments as frequently (weekly) as they were. Finally, it was noted that little transfer occurred from skills learned in handwriting period to other class sessions requiring writing. However, one teacher felt that teaching for transfer was not too difficult in this area and had experienced success in this regard with many of his pupils.

The Units at Giese School are conducting additional experimentation in handwriting this year. In the third grade, the students will be randomly assigned to three treatments, and the learning specialist will rotate between the three

groups and do the actual presentation of new lessons. One treatment, the traditional approach, will be handled in the regular classroom; much interest is centered on whether this treatment will again demonstrate only limited effectiveness. The other two will be handled in the Learning Center and will be individualized approaches (one of which will utilize two paraprofessionals working individually with the students). The primary objective of the handwriting experiment will be to create a desire in the children to do their best handwriting throughout the day, not just in handwriting class. Consequently, to encourage this transfer, much emphasis will be placed on self-evaluation and individual progress.

The fourth grade at Giese School will carry on its experiment in handwriting with the major changes being in the treatment designated as an individualized or a diagnostic approach to handwriting. No commercially developed materials will be used, but rather teacher diagnosis of individual needs will be followed by some common instruction and individual practice. Much of the material used in the handwriting class for this treatment will be the students' daily written work. Less emphasis will be placed on the "fastest" and more emphasis will be placed on the quality of handwriting under "normal" and "best" instructions.

IV

EXPERIMENTATION WITH READING MATERIALS

INTRODUCTORY REMARKS

The remaining five experiments reported have common attributes that are now presented in the interest of eliminating repetition.

In all five cases, the local personnel made excellent progress in identifying new materials and developing new approaches to reading instruction. The impetus to start an experiment came from the R & I Unit staff, not the R & D Center staff. Progress with the new instructional approaches was sufficiently rapid that units were able to begin a related experiment even though the Unit was not formed until the second semester. The time for detailed planning of the experiment was limited, and the duration of the experiments was too short to produce marked differences in reading behavior. The average length of the five reading experiments was only about six weeks.

Several substantial benefits seemed inherent in these so-called "quickie" experiments, namely:

(1) Unit personnel worked toward the development of an improved program in reading.

(2) Unit personnel became familiar with two or three experimental treatments related to reading because, under the rotation scheme, each teacher was involved in executing each treatment.

(3) Unit personnel gained familiarity with research procedures.

(4) Center personnel gained experience enabling them to work more effectively with the building principals and Unit members the following year.

An unexpected result of involvement in the research function was apparent early, namely the Unit personnel began operating more like a Unit. Indeed the systematic development of the instructional treatments and their execution for a few weeks produced high morale among the staff and heightened interest in the pupils.

A second area of communality across the five experiments concerned the overlap and similarity of the treatments implemented at the various grade levels and schools. Figure 1 lists the various programs related to reading materials that were subject to investigation in Racine, also the Units in which they were used are indicated. Reading across the rows suggests the extent to which a treatment was engaged in across Units; reading down the columns details the comparisons made in any given experiment.

The information presented below expands on the common treatment areas listed in Figure 1. Presentation of this information at this point will eliminate the necessity of duplication in the five following experimental summaries.

(1) Basal or Traditional Texts: The Macmillan and Scott-Foresman basal reading text methods might best be described as the "traditional" approach to teaching reading. The basic reader is supplemented by teacher worksheets, vocabulary introduction, and oral and silent reading.

(2) Programmed Reading: This partially individualized approach was embodied in the McGraw-Hill Programmed Reading Series. This program combines elements of structural linguistics and linear programming. Reportedly the child reads at his own pace and works independently to a large extent. The program consists of three series.

In Series I, children deal with more than one syllable, beginning punctuation, and plural and possessive forms. When the pupil finishes this series of seven books, he is provided with a hard-cover book which is closely correlated with the corresponding programmed text and is designed to provide a suitable transition to traditional reading materials. In Series II, the child learns to read, write, and spell over 1,300 phonetically regular words as well as the necessary sound-symbol relationships to reportedly learn thousands of other words. The seven books in this series introduce 28 vowel classes and 8 consonant classes while periodically reviewing those covered in Series I.

Reading Materials (Treatments)	School Location of Unit and Grade				
	Geise Third	Giese Fourth	Bull Second	Bull Third	Howell Fifth
Basal or Traditional Texts	Macmillan	Scott-Foresman		Macmillan	
Programmed Reading	McGraw-Hill			McGraw-Hill	
Individualized Reading		SRA Lab	SRA Lab		SRA Lab Macmillan Spectrum
Self-Expression in Language Arts			Small groups*		
Multi-Ethnic Basal Text				Scott-Foresman	Scott-Foresman

*No commercial program used.

Figure 1. Grid showing Unit location of various reading materials used in spring experimentation, Racine, 1966.

Series III continues the sound progression of II and covers the less usual sound-symbol relationships. The hard-cover books at this level move from a content of familiar things to fantasy and adventure.

Children who do not begin reading with this approach are placed in the proper book by means of diagnostic placement test.

(3) Individualized Reading: Products of both SRA and Macmillan were used for this treatment. The SRA Reading Laboratory, used in two experiments, reportedly allows each pupil to proceed at his own rate. By means of a placement guide each student purportedly begins in the lab at a point where he can meet a reasonable degree of success. The materials, which include multi-level reading selections as well as a reading-skills Power-Builder, are designed to be self-operating and self-correcting; still a teacher must be present to assure attention to the task at hand. Listening activities used throughout the program reportedly develop the student's ability to sift, retain, and understand what he hears as the teacher reads listening selections. Each child records his progress in his student record book. Various difficulty levels are embodied in different labs; the next subsequent lab can be utilized if needed. R & I Unit teachers followed the publisher's directions for use of the lab.

The Macmillan Reading Spectrum, used in one experiment, consists of two fundamental components: The Spectrum of Skills is a set of materials designed to guide the development of skills essential to reading proficiency in the intermediate and upper grades. It consists of six booklets in each of three reading-skill areas: word analysis, vocabulary development, and reading comprehension. The booklets are self-directing and self-correcting; each child can reportedly work at his own pace and keep his individual record of achievement, progress, and work habits. The three skills are developed in parallel categories; those of word analysis are presented in one set of booklets; those of vocabulary in other sets, etc. Hence, a pupil may work at one level in word analysis but at a different level in vocabulary development or reading comprehension. The various skills are color coded to enable students to work independently, and the materials provide for immediate reinforcement.

The Spectrum of Books, the second fundamental component, consists of sets of children's books selected in an attempt to

meet a wide range of reading interests and abilities. A spectrum consists of 30 different books, all of which are graded according to the Dale-Chall or Spache reading-ability formula.

(4) Self-Expression in Language Arts: This treatment was utilized in only one experiment and was directed as much at improving attitudes toward school as it was at enhancing reading achievement. This approach was used with a group small enough that it had some elements of an individualistic approach. The subjects receiving this treatment were given practice in brainstorming, listening (Dolch Word Game), and poem reading and recitation from the learning specialist.

(5) Multi-Ethnic Basal Text: This is a basic reader approach published by Scott-Foresman that utilizes a companion workbook. The only appreciable difference between this series and the usual basal series is the inclusion of additional ethnic groups along with Caucasian in the visuals.

In some cases, relatively minor additions to the five basic patterns above were incorporated in a treatment; these alterations will be detailed in connection with the description of each separate experiment.

THE EFFECT OF AN INDIVIDUALIZED INSTRUCTIONAL TECHNIQUE (PROGRAMMED READING) UPON POOR READERS' COGNITIVE SKILLS IN RELATED AREAS,

Giese School, Racine, Wisconsin

The third grade R & I Unit at Giese School (Earl Nelson, principal) engaged in two development and research undertakings concurrently. In addition to the handwriting experiment previously reported, the professional personnel in the Unit (Maxine Vohs, learning specialist, and teachers Janet Hansen, Beverly Schinderle, and Sammye Woods) developed an experiment involving the teaching of pupils with reading difficulties.

Thirty third-grade pupils were identified as having pronounced difficulty in reading on the basis of their scores on standardized achievement tests and as verified by teacher judgment. As such, these pupils were generally below average on nationally-normed standardized tests. Part of these pupils received a programmed reading approach (McGraw-Hill) while the second received the Macmillan basal text approach. These two treatments are fully described in the previous section of this report.

A stratified random sampling procedure was used in assigning pupils to the treatments. The 30 poorest readers in the Unit were stratified on the basis of sex and previous achievement level in reading (average grade placements on the Word Meaning and Paragraph Meaning subtests of the Stanford Achievement Test, Primary II, Form X, given in March, 1966) and then randomly assigned to treatments. Two groups of 15 subjects each were formed by this procedure. A pre-condition was established that the random assignment of pupils to experimental treatments would not be acceptable until approximately equal numbers of pupils from each of the three treatments in the ongoing handwriting experiment were assigned to the two treatment groups for this experiment. Thus, the random assignment was re-done until it resulted in a preponderance of no more than two pupils from any one handwriting treatment ending up in the two groups formed for this experiment.

From 60 to 90 minutes per day were devoted to the experiment. The experiment lasted just under seven school weeks. The teacher variable was controlled by rotating the teachers between treatments each week.

Certain tests of the Stanford Achievement Test, Primary II, were administered, primarily in connection with securing baseline data. In addition, two additional posttests were constructed with high content validity. Thirty words were randomly selected from each of the two treatments to form a 60-word test. This basic test was given as a spelling recall test and also as a test of word recognition, i.e., an oral reading test individually administered. Three scores were obtained from each test: number of programmed reading words correct, number of basal reader words correct, and total number of words correct (the sum of the other two scores).

Analysis of covariance was used in analyzing the data on each of the three dependent variables. The Spelling pretest of the Stanford Achievement Test was used as a covariate for the constructed spelling recall test, while the Word Study Skills pretest served as the covariate for the word recognition test.

As expected, the difference between the two treatments was not statistically significant on any of the three tests. The benefits of the experiment lay directly in the experience gained by the Unit personnel in developing and executing the new program and in participating in

the research. The Unit staff also concluded that the programmed material was not freely auto-instructional. Considerable teaching is apparently required with it also.

THE EFFECT OF AN INDIVIDUALIZED INSTRUCTIONAL TECHNIQUE (SRA READING LABORATORY) UPON POOR READERS' COGNITIVE SKILLS IN RELATED AREAS,
Giese School, Racine Wisconsin

The fourth-grade R & I Unit at Giese School also undertook a second activity after the handwriting experiment was underway. The learning specialist, Marilyn Kletecka, and the Unit teachers, Anne Buchanan, Charles Leonard, and Mary Rounds, selected the area of reading because of needs of many pupils in that subject area.

They were interested in identifying additional instructional materials and techniques that offered promise of being effective with the poorer readers in the Unit. To this end materials were gathered and developed to enhance achievement of poor readers; the related research was a comparison of progress in reading under the SRA Reading Laboratory with progress under the Scott-Foresman basal reading approach.

Fourth graders in the Unit were screened on the basis of standardized reading achievement test scores and teacher judgment; the 34 pupils appearing farthest behind in their reading skills were selected for participation. These pupils were, on the average, below national means on standardized achievement tests. They were first stratified by sex and previous achievement in reading (average grade placements on the Word Meaning and Paragraph Meaning subtests of the Stanford), then randomly assigned to two treatments. Two groups of 17 pupils each were thus formed. One received an individualized approach (SRA Reading Laboratory) while the second received a more traditional approach using the Scott-Foresman basal text. The essential features of these approaches are detailed in an earlier section of this report. As in the third-grade reading experiment, a precondition was established that the random assignment of pupils to experimental treatments would not be acceptable until approximately equal numbers of pupils from each of the three treatments in the ongoing handwriting experiment were assigned to the two treatment groups for this experiment. Thus, the random assignment was re-done until it resulted in a preponderance of no more than two pupils from any one handwriting treatment ending up in the two groups formed for this experiment.

Approximately 70 minutes each day for slightly less than seven school weeks were given to reading instruction. The two teachers involved were rotated between groups each week to aid in controlling the teacher variable.

Five subtests of the Stanford Achievement Test, Intermediate I, were the data gathered: namely, Word Meaning, Paragraph Meaning, Spelling, Word Study Skills, and Language. Form X had been given in mid-April, 1966, as a pretest; Form Y served as a posttest. Each criterion test was given to all subjects at the same time by a single test administrator. R & D Center personnel scored the posttest.

Analysis of covariance of raw scores (number correct) were used to analyze the data for each of the five dependent variables with the pretest scores used as covariables, respectively. Treatment served as an active independent variable while sex and previous reading achievement were assigned independent (stratifying) variables.

As expected, differences between the methods employed were again not significant and no definitive results of major import were obtained in this experiment. It is interesting to note, however, that pupils with past records of high reading achievement (relative to the other pupils in the study) outgained those in the average and low previous achievement levels on the Word and Paragraph Meaning subtests and those in the average stratum likewise outperformed the lows. On the Word Study Skills and Language subtests, both the high and average strata pupils outperformed the low stratum subjects, but not each other. It is somewhat unusual, but males made more substantial gains on the Word Meaning subtest than females. In conclusion, the involvement of Unit members in the activities fostered the development of a Unit cohesiveness and familiarized the teachers with some new reading materials and research procedures.

THE EFFECTS OF INDIVIDUALIZED INSTRUCTIONAL AND SELF-EXPRESSION SESSIONS ON PUPIL ATTITUDES AND PUPIL COGNITIVE SKILLS IN READING AND RELATED AREAS,
Stephen Bull School, Racine, Wisconsin

Two R & I Units were housed in Stephen Bull School, Racine, Wisconsin (Frank Sweet, prin-

cipal). The second-grade Unit contained the learning specialist, Henrietta Marx, two certified teachers, Lois Borg and Lula Robinson, and somewhat over 60 pupils.

The behavior patterns of 12 boys in this Unit were such that it was felt that they would profit most by receiving special treatment for portions of the school day. The purpose of this instruction was to give these 12 pupils supplemental individualized instruction for an hour each day with a view to modifying their classroom behaviors as well as improving their cognitive skills in the reading-language arts area. To facilitate this purpose, the group was divided into two smaller groups of six each. In addition to the 12 boys displaying poor school behaviors, 19 others were identified but received no formal instruction. This control group was made up of all boys in the Unit that had achievement patterns most similar to the 12 boys already identified; but obviously, their behavior patterns were not as extreme.

The two treatments are described in an earlier section of this report. The individualized reading program utilized was the SRA Reading Laboratory, while the learning specialist designed the activities and procedures used in small group self-expression sessions. They were given in addition to the usual reading-language arts instruction that the boys received and were given only by the learning specialist. Time of day of instruction and subject matter missed while absent from the regular class was controlled for the two treatments.

In order to determine the effectiveness of the special treatments, four cognitive measures were used: the Word Reading, Paragraph Meaning, Vocabulary, and Word Study Skills subtests in the Stanford Achievement Test, Primary I. Form X was given before the study began, while Form Y was given at the conclusion.

In the affective area, a short 25-item rating scale was used. Teachers and the learning specialist independently rated a pupil's behavior before and after the experiment was conducted. Experimental pupils were rated on their behaviors during the special experimental sessions, while all pupils had their behavior rated for "the regular school day." Favorable behaviors were indicated by high numerical scores on the inventory. The treatments were administered for 60 minutes each day for seven school weeks.

All subjects were given the cognitive criterion tests at the same time by one administrator to reduce any variable due to administration. Both the cognitive tests and behavior ratings were scored by a team of scorers at the R & D Center. All data were analyzed via analysis of covariance techniques with original achievement as the covariable.

The fact that no treatment differences were evident in any of the analyses was encouraging because of original differences among the groups. Viewed also as being encouraging was the fact that in only one case, Word Study Skills, was previous achievement difference significant. These results should be interpreted cautiously however, because of the lack of statistical power in the design that was used.

It should be noted though that all three groups, both treatment groups and the control group, made substantial absolute gains on the behavior ratings. For the regular school day, this was particularly true of the pupils in the self-expression treatment, although not to the extent that their behaviors appeared significantly more improved than the individualized reading or control pupils.

Although there were improved behaviors exhibited, it may be unwarranted to conclude that they definitely resulted from the treatments conducted; it should be remembered that the control pupils had not exhibited behavior problems at the start of the study while the experimental pupils had and, in a sense, there was less room for the control subjects to improve. In any event, the 12 boys needing special treatment received it with encouraging results.

THE EFFECT OF TWO TECHNIQUES OF READING INSTRUCTION ON PUPIL COGNITIVE SKILLS IN READING

Stephen Bull School, Racine, Wisconsin

The third-grade R & I Unit at Stephen Bull School in Racine also conducted experimentation in reading. The Unit is made up of a learning specialist, Mae Elsdon, four certified teachers, Eunice Bethke, Mattie Boykins, Linda Carlson, and Josephine Salisbury, and approximately 100 pupils.

Many of the pupils in the Unit were performing poorly in reading. The Unit staff was interested in exploring and using new materials that might prove more effective with these pupils. Those selected were: (1) a programed reading approach, (2) a multi-ethnic reader supplemented by a Word Games Reading Laboratory, and (3) the control (basal reader).

The 42 poorest readers in the Unit were selected on the basis of past standardized

achievement test scores and teacher judgment. The pupils as a group were noticeably below the national average on standardized achievement tests. Almost 90 per cent of the subjects in the experiment were not Caucasian.

The programed reading treatment was implemented through use of the McGraw-Hill Programed Reading Series. The multi-ethnic reader used in the second treatment was published by Scott-Foresman. Instruction under this treatment was supplemented by the Word Games Reading Laboratory (SRA), the phonics portion of the reading laboratory, designed to help students develop their reading vocabularies to match their listening vocabularies. Intrinsic motivation is allegedly provided by the pupil working at a point where he can experience success and progress independently through a sequentially developed continuum that begins with the sounds of single consonants and vowels and moves through consonant blends, diagraphs, phonograms, and diphthongs. The control group students continued with the reading instruction program already being used; they were instructed with other pupils in the Unit not involved in the experiment. These students use a "traditional" Macmillan basic reader. These treatments are more completely described in an earlier section of this report.

To determine the effectiveness of these approaches, five subtests of the Stanford Achievement Test, Primary II, were utilized: Word Meaning, Paragraph Meaning, Spelling, Word Study Skills, and Language. Form X was used as a pretest; Form Y as a posttest. In addition, a 60-word test was locally developed similar to the one constructed for the third-grade reading experiment at Giese School. The words were given in a spelling recall format and also as an oral word recognition test. Half the words were randomly selected from the McGraw-Hill programed materials and half from the Scott-Foresman multi-ethnic reader (this latter half overlapped at many points with words used in the Macmillan basal reader). From each of the two tests, three scores were derived: number or programed words correct, number of basal reader words correct, and total number of words correct.

The treatments lasted for seven weeks. The teacher as a source of variance was controlled by rotating the teachers across the three instructional treatments. Subjects were given the criterion tests at the same time by a single test administrator. Scoring of the data was completed by a scoring team at the R & D Center. Analysis of covariance was used for each of the dependent variables. Alternate form subtests were covariates for the Stanford scores. The Stanford spelling pretest also was used as a covariate for the spelling recall scores, while the Word Study Skills pretest was the covariate for the word recognition scores.

A finding of some interest was a significant main effect for treatment on the Word Study Skills subtest. This stood out for two reasons: first, the absence of any other treatment effects; and, second, the fact that the performance under the multi-ethnic treatment was superior. (Recall that the pupils were nearly all non-white.) Since a treatment effect appeared only on this dependent variable and none of the others, and since it reached only the .05 level of significance, it might be best described and discussed as provocative rather than definitive.

Previous reading achievement levels and sex were seldom significant, but significant treatment by previous achievement interactions were. They too seemed provocative rather than definitive. In the multi-ethnic treatment group, a gap in performance between the high and average previous achievers, on the one hand, and the low, on the other, is of great interest, but possible explanations are not easily forthcoming. It would be well to recall that each cell mean was dependent upon the performance of three (and, in a few cases, two) subjects; thus, spurious effects could have been in evidence. There do seem to be enough provocative questions generated in this short experiment to suggest that additional work might be profitable in the area of providing materials and models in which ethnic composition is varied systematically.

THE EFFECT OF THREE TECHNIQUES OF READING INSTRUCTION, INCLUDING TWO IN INDIVIDUALIZED APPROACHES, UPON PUPIL COGNITIVE SKILLS IN READING

Howell School, Racine, Wisconsin

Howell School in Racine, Wisconsin (Glynn Humphrey, principal), has its R & I Unit established at the fifth-grade level. The learning specialist, Jerry Sullivan, and the Unit teachers, Joseph Ban and Al Hovgaard, expressed concern about the reading difficulties of many children in the Unit. There are a total of 63 pupils in the Unit.

A generally low level of reading skills in most of the pupils of the Unit led to the development and research of three instructional approaches to reading. Two were individualized and one was a multi-ethnic reader.

All 63 fifth-grade pupils in the Unit experienced one of the approaches. Pupils were, on the average, about one year below grade placement in reading and related areas as determined by the national norms of a standardized achievement test. Over 60 per cent of the pupils in the R & I Unit were non-white.

The following materials were selected for the three approaches: (1) the SRA Reading Laboratory, (2) the Macmillan Reading Spectrum, and (3) the Scott-Foresman multi-ethnic basal reader. The first two sets of materials are ordinarily described as "individualized"; all three approaches are described in detail in an earlier section of this report.

Treatments were administered 60 minutes each day for a period of six weeks. The teacher variable was again controlled for rotating teachers between treatments weekly. Separate analysis of variance procedures were used for each of the scores.

As explained in an earlier section, it was considered unlikely that treatment effects of any considerable magnitude could be generated in just six weeks, but involvement in new approaches was viewed as being valuable as an inservice activity for teachers. Two main effects did reach significance, sex and previous achievement level, as was expected.

The study had other benefits in addition to the knowledge of each method that teachers were able to attain in the short period that the study was conducted through their periodic rotation among treatments. The pupils, too, seemed to enjoy the changed pace and the variety of teachers afforded them. It is none too soon for school itself to become rewarding.

CONCLUDING REMARKS: EXPERIMENTATION WITH READING MATERIALS

One of the move obvious impressions that a person gets after reading the five reading experiments is the rarity with which definitive results were obtained, i.e., the infrequency with which a treatment effect reached significance. This was not entirely unexpected. Reference to the "Introductory Remarks" section of this chapter allows review of four benefits that did occur from these short experiments, namely: (1) staff involvement on a problem of immediate concern to them; (2) development of staff appreciation of research as a tool for improving educational programs; (3) development of staff expertise with several approaches to the teaching of reading; and (4) development of a foundation upon which to build more sophisticated research undertakings in later years. In addition to promoting Unit cohesiveness, the research involvement allowed teachers to realize that children gained great benefit from individual attention and immediate and positive reinforcement.

This year the third-grade Unit at Stephen Bull School, Racine, is using the programed materials with some students who are far below grade level in reading. These are used in addition to their regular reading program and scheduled reading time. Mrs. Mae Elsdon, the learning specialist, directs the children in this activity and follows their progress closely. Also, volunteer aides are providing individual attention for each student as he reads or discusses a book that he has read. Reporting has assumed a new air when an interested person discusses the story, looks at illustrations, or listens to the reading of a favorite selection. Rewards are being used as motivation for reading; the first reward is given after two books have been read, another after five, and in multiples of five thereafter.

The second-grade Unit at Bull School has now been combined with first graders into a nongraded primary unit. Motivation to progress at the students' own level has been greatly improved by the removal of grade level materials. Individual attention and guidance is one of the big responsibilities and interests of the new learning specialist, Pat Hansen. Children are grouped according to needs for the skills. Free and independent reading are encouraged by volunteer aides who operate in much the same manner as with the third-grade Unit.

The new materials that were used in the Giese and Howell Schools' reading experiments are being used by several teachers in the Units and with students according to their needs and abilities. There appeared to be a definite improvement at Howell in the fifth-grade students' desire to do more independent reading. This may have been brought about by the use of the Scholastic paperback books and the learning specialist providing individual attention in the students' reporting. Macmillan's Spectrum is being used throughout the reading program at Howell this year. The use of the SRA Reading Laboratories has made the teachers aware of the need to provide for the individual differences in basic skills. A constant regrouping of the students is evident this year. Several of the Units are planning to do some controlled experimentation second semester to further stimulate the continuous improvement of their reading programs.